

Isolated Abducens Nerve Palsy: A Case Report of Cerebral Pseudocyst of Dorello's Canal

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Abstract

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Background:

Abducens nerve is the second longest intracranial path out of all of the cranial nerves. Abducens nerve palsy had a prevalence 11.3/100.000 and mostly seen in adults. Isolated abducens nerve palsy due to neoplastic lesion are rare and mostly related to skull base tumor.

Case Description:

We present a case of 57 years old woman with complaints of red right eye and worsening headache associates with diplopia on the right lateral gaze for three days prior admission. She was later diagnosed with isolated abducens nerve palsy associated to neoplasm cause in Dorello's canal. Patient was then discharged with symptomatic therapy and educated for head posturing and avoid triggers.

Conclusions:

Abducens nerve palsy is the most common isolated ocular nerve palsy. The incidence of mass formation such as neoplastic lesion or cyst are rare.

Introduction

Of all the cranial nerves, the abducens nerve has the second longest intracranial path. This nerve may be impacted at the petrous apex, cavernous sinus, superior orbital fissure, or eye orbit. Anything that compresses or stretches the nerve can damage the abducens nerve. Therefore, it is critical to pinpoint the lesion of abducens nerve palsy for proper diagnosis and therapy. Isolated abducens nerve palsy due to neoplastic lesion^{1,2,3} are rare and mostly related to skull base tumor. Kim et al, found that only 14.3% of the 807 confirmed cases

of solitary abducens nerve palsy were connected to neoplasm.⁴ Here we described a case of isolated abducens nerve palsy associated with neoplasm lesion in Dorello's canal (petroclival venous confluence).

Case Summary

A 57 years old woman presented at our hospital with a red right eye and worsening headache associated with diplopia on the right lateral gaze for three days prior to admission. The patient claimed that she had experienced these complaints for one year. Upon neurological assessment, there

was binocular horizontal diplopia associated with total right abducens nerve palsy. Other physical and blood examinations are normal. There were no signs of elevated intracranial pressure. Investigations including perimetry and optical coherence tomography were carried out, and the results were within normal limits. Magnetic resonance imaging (MRI) with contrast revealed a dilated right dorello's canal with a non-enhanced cystic lesion on the right side of the superoposterior cavernous sinus (0.8 x 0.5 x 0.5 cm), raising the possibility of a pseudocyst. There is no evidence of either aneurysm or thrombosis of the cavernous sinus. When compared to previous MRI (one year prior), it was comparable.

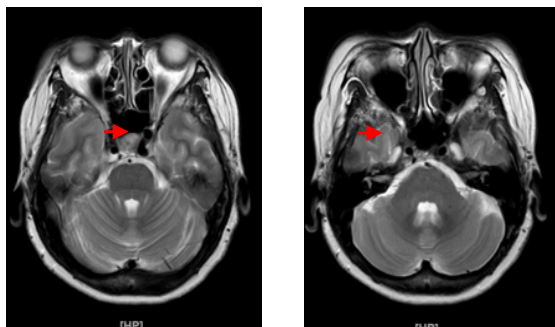


Figure 1. Magnetic Resonance Imaging (MRI) with contrast in T2 sequences revealed a dilated right dorello's canal with a non-enhanced cystic lesion on the right side of the superoposterior cavernous sinus (0,8x0,5x0,5 cm).

Although we were unable to make a definitive diagnosis, we assumed the lesion was benign. Therefore the patient was discharged and continues to be monitored at the outpatient clinic without any

operation. Symptomatic therapy was administered, and the patient was educated for head posturing and on how to avoid potential triggers.

Discussion

According to reports, abducens nerve palsy are the most typical isolated ocular motor cranial neuropathy.^{3,5} The yearly prevalence of abducens palsy is 11.3/100,000 and mostly seen in adults.⁶ The abducens nerve's neuroanatomy is separated into four unique sections: the nucleus, the cisternal part, the cavernous region, and the orbital portion. The abducens nucleus originates from the caudal dorsal pons, below the fourth ventricle. These nerve fibers emerge and leave the nucleus superiorly to form the abducens fascicle in the brainstem, then exits the brainstem at the pontomedullary junction to reach the subarachnoid region. The nerve then turns sharply and rises steeply over the tip of the petrous part of temporal bone towards the clivus within a fibrous sheath called Dorello's canal and enters the inferior dura mater to the posterior clinoid process. Dorello's canal is the gap between the petrous apex and the superolateral section of the clivus, which is superiorly restricted by the petrosphenoidal ligament of Gruber (Gruber's ligament). The components included in this canal are bound together and significantly limit their mobility. The inner meningeal tube that surrounds the nerve severely

limits the movement of the abducens nerve within Dorello's canal. Because the abducens nerve is anchored in Dorello's canal, it is vulnerable to straining when intracranial pressure rises for a variety of reasons such as venous congestion, edematous pressure or cancerous infiltrates.^{7,8} This nerve then enters the cavernous sinus along with the oculomotor nerve, trochlear nerve, and the first branch of trigeminal nerve. Before following the sphenoidal fissure, it laterally follows the internal carotid artery and medially to the sinus lateral wall. The nerve then enters the orbit via the superior orbital fissure within the tendinous ring, eventually reaching the lateral rectus muscle.^{5,7}

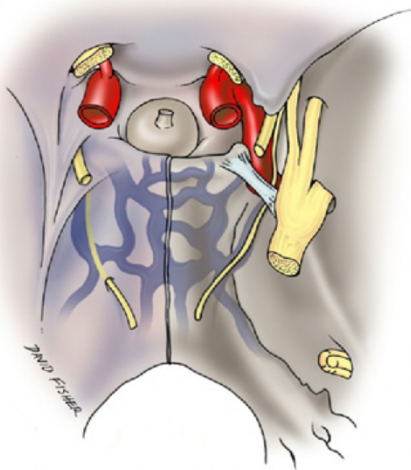


Figure 2. The abducens nerve are illustrated schematically as they proceed through the Dorello canal. The nerve enters the dura near the beginning of the canal on the left side and goes anteriorly into the cavernous sinus through the opening inferior to the Gruber ligament, as seen on the right side of the picture.⁹

The isolated sixth nerve palsy has different kinds of etiology. The most common underlying pathology is microvascular causes, about 56% cases are caused by vascular disease especially in advanced age. Isolated abducens paralysis is associated with a vascular risk factor such as diabetes (44.4%), hypertension (33.3%), coronary artery disease (13.9%), smoking (13.9%), and hyperlipidemia (8.3%). The other most common etiology are idiopathic (27.2%), inflammatory diseases (8.3%), infections (8.3%) such as Lyme disease, syphilis, tuberculosis and cryptococcus, increased intracranial pressure (8.3%), demyelinating (2.5%), cerebral aneurysm (1.9%) and procedure-related injury (1%). Neoplasm (5.6%) and trauma (4.9%) may also affect the abducens nerve at any point along its course and resulting in sixth nerve palsy.¹⁰

A summary of six retrospective studies on patients with sixth nerve paresis showed 6% to 30% attributed to a miscellaneous group that includes migraine, pseudotumor cerebri, multiple sclerosis. Furthermore 6% to 29% etiology are undetermined, indicating vulnerability of the nerve to conditions which are transient, benign, and unrecognizable.¹¹ Our case described a female patient with no comorbidities or vascular risk factors, presented with an episode of diplopia and right sided headache. Ischemic, autoimmune, inflammatory, and traumatic causes were ruled out since the history and laboratory

tests were inconclusive. However, neuroimaging using contrast MRI was done and showed pseudocyst on the right superoposterior cavernous sinus of the dorello's canal.

MRI is an efficient and safe tool for determining the underlying cause of isolated abducens nerve palsy in patients without identifiable vasculopathic risk factors. It is useful for identifying brain demyelination, infarction, infections, neoplasm, and other mass lesions that are related to nerve palsy.^{12,13} In our case, it is suspected that the pseudocyst is likely to cause abducens nerve palsy in our patient by increasing pressure in the dorello's canal and compressing the abducens nerve. This is a rare occurrence of isolated abducens nerve palsy caused by benign neoplastic lesion.^{12,13,14}

Patients who develop sixth nerve palsy will often present with binocular horizontal diplopia and notable weakness of ipsilateral lateral rectus muscle leading to a deficit eye abduction of the affected side.³ In our patients, we saw two common symptoms: diplopia and ipsilateral weakness. The two typical symptoms might lead to side effects that develop in later stages such as headache, vomiting and conjunctival injection that cause eye soreness. Patients also present with a head turn and/or strabismus to maintain binocularity and binocular fusion as coping mechanisms to diplopia in long term findings as seen in our patient.

Therapeutic modalities ranged from conservative treatment, botulinum toxin injections, and surgical treatment in cases of abducens nerve palsy. Due to the size of the pseudocyst that is relatively the same as the previous imaging one year ago, it is concluded that the pseudocyst is not progressive. Treatment that was suggested to the patients are conservative treatment such as patching, and prism therapy could be used to prevent amblyopia in the affected eye. Patching consists of closing each alternating eye for hours using eye patch. Another conservative treatment suggested is prism therapy which requires the placement of a temporary press-on prism on the lens of the affected eye. Other modalities such as botulism injection could also be given to this kind of cases with residual function of the lateral rectus muscle. Surgical treatment of the lateral rectus muscle called strabismus surgery was also suggested in this case. This surgery consists of resection, recession, or transposition of the eye muscles.^{15,16,17}

Conclusion

The abducens nerve palsy is the most common isolated ocular nerve palsy due to its neuroanatomy and the long intracranial course. Multiple etiologies are recognized based on the location of an abnormality, however the incidence of mass formation such as neoplastic lesion or cyst are rare. In the absence of risk factors or positive laboratory and clinical results,

neuroimaging such as MRI scan can be a valuable diagnostic technique in determining the specific origin of sixth nerve palsy.

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References

1. Lucio LL, Freddi TD, Ottaiano AC. The Abducens Nerve: Anatomy and Pathology. *Seminars in Ultrasound, CT and MRI*. 2022 Oct 1;43(5):414-419. <https://doi.org/10.1053/j.sult.2022.04.008>
2. Nakamizo A, Matsuo S, Amano T. Abducens nerve schwannoma: a case report and literature review. *World Neurosurgery*. 2019 May 1;125:49-54. <https://doi.org/10.1016/j.wneu.2019.01.123>
3. Erdal Y, Gunes T, Emre U. Isolated abducens nerve palsy: Comparison of microvascular and other causes. *Northern Clinics of Istanbul*. 2022;9(4):353-357. <https://doi.org/10.14744/nci.2021.15483>
4. Kim HJ, Kim HJ, Choi JY, Yang HK, Hwang JM, Kim JS. Etiologic Distribution of Isolated Abducens Nerve Palsy: Analysis of 807 Patients and Literature Review. *European Journal of Neurology*. 2023 Aug;30(8):2471-2480. <https://doi.org/10.1111/ene.15828>
5. Elder C, Hainline C, Galetta SL, Balcer LJ, Rucker JC. Isolated abducens nerve palsy: update on evaluation and diagnosis. *Current neurology and neuroscience reports*. 2016 Aug;16(8):1-7. <https://doi.org/10.1007/s11910-016-0671-4>
6. Patel SV, Mutyala S, Leske DA, Hodge DO, Holmes JM. Incidence, associations, and evaluation of sixth nerve palsy using a population-based method. *Ophthalmology*. 2004;111(2):369–375. <https://doi.org/10.1016/j.ophtha.2003.05.024>
7. Ezer H, Banerjee AD, Thakur JD, Nanda A. Dorello's canal for laymen: a Lego-like presentation. *Journal of Neurological Surgery Part B: Skull Base*. 2012 May;73(3):183-189. <https://doi.org/10.1055/s-0032-1311753>
8. Tubbs RS, Radcliff V, Shoja MM, Naftel RP, Mortazavi MM, Zurada A, Loukas M, Gadol AA. Dorello canal revisited: an observation that potentially explains the frequency of abducens nerve injury after head injury. *World Neurosurgery*. 2012 Jan 1;77(1):119-21. <https://doi.org/10.1016/j.wneu.2011.03.046>
9. Wang JM, Edwards BA, Loukas M, Oskouian RJ, Tubbs RS. Supernumerary abducens nerves: a comprehensive review. *World Neurosurgery*. 2018 Apr 1;112:39-45. <https://doi.org/10.1016/j.wneu.2017.11.052>

10. Nguyen V, Reddy V, Varacallo M. Neuroanatomy, Cranial Nerve 6 (Abducens). In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430711/>
11. Graham C, Mohseni M. Abducens Nerve Palsy. [Updated 2023 Jan 1]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482177/>
12. Chan NC, Li VS, Cheng AC, Cheung TC, Lo SS, Chan CK. Diagnostic pitfall of progressive isolated abducens nerve palsy: a report of two cases. Hong Kong Journal of Ophthalmology. 2022 Jun 29;26(1):32-34. <https://doi.org/10.12809/hkjo-v26n1-318>
13. Baybora H, Kaya F, Koçak İ, Karabela Y. MRI results of patients with acute isolated cranial nerve palsies. Turkish Neurosurgery. 2020;30(2):178-181. <https://doi.org/10.5137/1019-5149.jtn.24775-18.4>
14. Nair AG, Ambika S, Noronha VO, Gandhi RA. The diagnostic yield of neuroimaging in sixth nerve palsy-Sankara Nethralaya Abducens Palsy Study (SNAPS): Report 1. Indian journal of ophthalmology. 2014 Oct;62(10):1008-12. <https://doi.org/10.4103/0301-4738.146000>
15. Toda M, Kosugi K, Ozawa H, Ogawa K, Yoshida K. Surgical Treatment of Cavernous Sinus Lesion in Patients with Nonfunctioning Pituitary Adenomas via the Endoscopic Endonasal Approach. J Neurol Surg B Skull Base. 2018 Oct;79(Suppl 4):S311-S315. <https://doi.org/10.1055/s-0038-1667123>
16. Sabermoghadam A, Etezzad Razavi M, Sharifi M, Kiarudi MY, Ghafarian S. A modified vertical muscle transposition for the treatment of large-angle esotropia due to sixth nerve palsy. Strabismus. 2018 Sep;26(3):145-149. <https://doi.org/10.1080/09273972.2018.1492621>
17. Rowe FJ, Hanna K, Evans JR, Noonan CP, Garcia-Finana M, Dodridge CS, Howard C, Jarvis KA, MacDiarmid SL, Maan T, North L, Rodgers H. Interventions for eye movement disorders due to acquired brain injury. Cochrane Database Syst Rev. 2018 Mar 05;3(3):CD011290. <https://doi.org/10.1002/14651858.cd011290.pub2>

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